THE EFFECT OF THE 2010 NEW YORK HIV TESTING LAW ON ACUTE CARE FOR HIV PATIENTS

A Thesis

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Master of Science in Health Policy and Economics

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ABSTRACT

In 2010 New York passed state legislation that required providers to offer HIV testing and linkage to care to all patients aged 13-64 years seeking routine medical care in all settings, including emergency departments and hospitals. Previous studies have looked at the effect of the 2010 HIV testing law on testing volume and HIV diagnoses, but have not examined how the state policy affects acute care utilization and outcomes.

A differences-in-differences regression model was developed using hospital discharge records collected from New York and Florida by the Healthcare Cost and Utilization Project from 2008-2012. The model evaluated whether the presence of the 2010 HIV testing law in New York has had an effect on HIV-related hospital admissions in the two years before and after its implementation, using Florida as a comparison.

The results of our analysis indicate that the 2010 HIV testing law decreased the percentage of hospital admissions that were HIV-related by 0.07 percentage points, when controlling for patient characteristics in addition to state, hospital and year effects. Although statistically significant, the small magnitude of the estimated effect suggests that state policymakers seeking to reduce acute care utilization for patients with HIV should supplement such laws with other policies or funding programs. These might include support for either more effective implementation of the mandate or programs that provide outreach, support, and treatment for HIV patients. Future studies should examine the long-term effects of the HIV testing law on acute care utilization or look at the effect on utilization of services in outpatient settings.

BIOGRAPHICAL SKETCH

Andrew Huang is a Master's candidate in the Health Policy and Economics Program at the Weill Cornell Graduate School for Medical Sciences. Andrew is currently employed as a Strategic Projects Analyst for the Primary Care Information Project at the New York City Department of Health and Mental Hygiene, where he provides technical assistance, performance analytics and change management process to support healthcare providers with quality improvement and practice transformation projects.

Born in Manhattan and raised in Queens, NY, Andrew attended Stuyvesant High School and completed his undergraduate studies at Cornell University, majoring in China and Asia-Pacific Studies with minors in Health Policy and Biological Studies. His academic interests are in the fields of health services research, health economics and the use of both clinical and claims data to inform public health programs and health policy decisions.

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BACKGROUND

According to the Centers for Disease Control and Prevention (CDC), there are over 1.2 million people in the United States living with human immunodeficiency virus (HIV) infection. If left unscreened and untreated, HIV infection leads to progressive failure of the human immune system, also referred to as acquired immune deficiency syndrome (AIDS), which increases the risk of life-threatening opportunistic infections and disease. This has an effect on acute care utilization in the United States, as individuals who are positive for HIV infection (HIV+) make emergency department (ED) visits at a higher annual rate and are more than two times as likely to be admitted into a hospital than individuals without HIV infection.[1]

Although there is no cure for HIV infection, adherence to current anti-retroviral treatments can suppress HIV viral loads and prevent HIV-related morbidity and mortality. However, diagnosis and linkage to care for HIV+ patients is still a major public health issue in the United States. The CDC estimates that only 60% of HIV+ individuals in the United States have been tested and linked to at least one visit for HIV care.[2]

One proposed intervention to improve outcomes for HIV patients is the routine offering of rapid HIV tests in EDs and the subsequent linking of newly diagnosed HIV+ patients to outpatient HIV care. In a study performed from January 2005 to March 2006, the CDC integrated rapid HIV testing into the healthcare services routinely offered at three EDs in Los Angeles, New York, and Oakland and found that 56% of patients that were offered an HIV test provided voluntary opt-in consent, and 88% of patients newly diagnosed with HIV were linked to care, defined as the patient receiving at least one medical follow-up visit specifically for HIV care and treatment.[3] As a result of this study, the CDC decided in 2006 to make revisions to their clinical recommendations encourage healthcare providers to incorporate routine opt-out HIV testing in all health care settings.[4]

Following the changes in CDC recommendations, the New York state legislature passed the 2010 HIV testing law, an amendment that extended public health law to mandate that all providers in New York (1) offer a voluntary HIV test to all patients aged 13-64 years seeking care in any healthcare setting, and (2) link patients with follow-up care if they test HIV+. Effective September 2010, the legislation also relaxed informed consent requirements by allowing providers to include opt-out HIV testing into general medical consent.[5]

New York is the first and currently the only state to have implemented a law with a provider mandate to offer testing and linkage to care to patients with HIV infection. The intent of the law raises questions about the role of legislative mandates and whether they are an effective tool for governments and other public health institutions to encourage healthcare providers to follow nationally accepted clinical guidelines for managing HIV infection. While other evaluations have looked at the implementation of the 2010 HIV testing law and its effect on the incidence of HIV diagnoses in New York and confirmed increases in overall HIV testing volume, no study has yet looked at whether the law has resulted in improvements in the quality and efficiency of health care delivery for patients with HIV, which is the ultimate goal of HIV testing laws.[6]

RESEARCH QUESTION

This paper seeks to identify the effect of the 2010 HIV testing law on HIV-related hospital admissions for patients aged 13-64 in New York. Our hypothesis is that there should be a reduction in HIV-related hospital admissions after the implementation of the HIV testing law in 2010, as more providers in New York comply with the law to screen patients for HIV infection and refer HIV+ patients to outpatient settings for routine HIV care and treatment.

One method for analyzing the causal effect of the 2010 HIV testing law on HIV-related admissions in New York is a differences-in-differences analysis. This approach compares the trend of hospital admissions for patients with HIV-infection in New York before and after the policy change, relative to the same periods of time for a state that did not implement a similar law. One state that serves as an ideal control for New York is Florida (FL), which had kept strict informed consent restrictions for HIV testing and did not implement a mandate for routine testing and linkage to care for HIV (Table 1).

Table 1. Comparison of HIV policies for New York and Florida from 2008-2012.

	2008 –2010 (pre-HIV testing law)	2011 –2012 (post-HIV testing law)
NY	• No routine HIV testing • Informed consent to test required	• Mandatory routine HIV testing and linkage to care • General medical consent, opt-out
FL	• No routine HIV testing • Informed consent to test required	• No routine HIV testing • Informed consent to test required

Florida was also chosen as the comparison state because it (1) data was available for the study period, (2) it has a relatively large population, and (3) it is not a close distance to New York, which reduces the likelihood of a treatment contamination effect

where patients from Florida seek care in New York, which could bias the estimated effect of the HIV testing policy towards the null.

In this study we sought to analyze the differences in the differences in HIV-related admissions between NY and FL in the time periods before (2008-2010) and after (2011-2012) the policy change. Because of the presence of the HIV testing law, we would expect providers to be more vigilant in testing and linking patients to care in New York for HIV at greater rates than providers treating patients in Florida. This used to identify the legislative mandate in NY as the mechanism by which trends in HIV-related hospitalizations change relative to Florida.

DATA DESCRIPTION

This paper uses data from the State Inpatient Databases from the Healthcare Cost and Utilization Project (HCUP), which is a collection of longitudinal databases maintained by the Agency for Healthcare Research and Quality (AHRQ) that contain encounter-level information on all inpatient discharges from short-term, acute care, nonfederal, general, and other specialty hospitals in participating states.

The data elements collected in HCUP databases are built from hospital administrative data, such as hospital billing records, and contain data elements on patient admission (e.g. dates of admission, source of admission and type of admission), patient characteristics (e.g. age, sex, race and zip code), International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) procedures and diagnoses, and hospital identifiers.

In this study we used 2008-2012 hospital discharge data from New York and Florida. To capture the treatment effect and limit outliers in hospital admissions, we limited discharge records to those for which the age of the patient at admission was between 13 and 64 years and the length of stay was not greater than 20 days to reduce the influence of outliers.After selecting the records that met the inclusion criteria, we then identified the percentage of admissions that were HIV-related in New York and Florida for each year by creating a new variable to indicate the presence of either a "V08" ICD-9-CM diagnosis code for asymptomatic HIV infection status or a "042" ICD-9-CM diagnosis code for symptomatic HIV disease as a primary or secondary diagnosis listed on the record.[7] Records were also marked as HIV-related if they contained a single-level Clinical Classification Software diagnosis category level of "5," which the AHRQ uses to classify hospital records containing diagnoses or procedure codes indicating that the admitted patient has symptomatic or asymptomatic HIV infection.[8]

STATISTICAL ANALYSIS

The following regression was performed, with an HIV-related hospital admission (HIVADMIT) as the binary outcome variable and presence of the 2010 HIV testing law at the date of admission (POLICY) as the determinant of interest:

$$HIVADMIT = \beta_1 POLICY + \beta_2 FEMALE + \beta_3 AGEGROUP + \beta_4 RACE + \beta_5 PAY1 + FE_{state} + FE_{year} + FE_{hospital} + \varepsilon$$

Patient demographic characteristics such as age, gender, race, and primary insurer at admission were also included as explanatory variables in the regression analysis. The measure for patient gender (FEMALE) was an indicator variable for whether or not the patient is female or male.

The measure for patient age at admission (AGEGROUP) was a categorical variable with values matching the three patient age groups affected by the HIV testing law: (1) adolescents 13-17 years of age, (2) adults 18-44 years of age, and (3) older adults 45-64 years of age.

Patient race (RACE) was a categorical variable with values indicating if the patient identified as: (1) white, (2) black, (3) Hispanic, (4) Asian and Pacific Islander, (5) Native American or (6) mixed or other group not listed. Finally, the variable for patient payer (PAY1) indicates the primary expected source of payment listed in the record: (1) Medicare, (2) Medicaid, (3) Private, (4) Self-pay, (5) No charge and (6) Other.

Indicator variables for state (FE_{state}), year (FE_{year}), and hospital ($FE_{hospital}$) fixed effects were also included in the regression model to control for state and hospital influences on HIV admissions that were independent of time, as well as temporal trends.

Linear probability models were used for estimation. Although this overlooks the binary nature of our outcome, estimates should be consistent with logit models due to the

very large sample size.[9] Three fixed effects models were used for estimation with the explanatory variables: (1) with just the policy variable, (2) the policy variable with patient characteristics, and (3) the second model with the addition of the primary payer included as an explanatory variable. All statistical analyses were conducted using Stata/MP version 14.1 (StataCorp).

RESULTS

Characteristics of New York and Florida hospital admissions before and after the HIV testing law policy change appear in Table 2. In New York, there were 4,005,451 admissions in the 3 years from 2008 to 2010 and 2,586,229 hospital admissions in the 2 years after the 2010 HIV testing policy was passed and implemented. In Florida, there were 3,797,780 admissions in the pre-period and 2,573,973 admissions in the post-period.

Table 2. Characteristics of New York and Florida hospital admissions from 2008-2012.

	New York		Florida	
	2008 –2010 pre-period (n = 4005451)	2011 –2012 post-period (n = 2586229)	2008 –2010 pre-period (n = 3797780)	2011 –2012 post-period (n = 2573973)
Sex (n, %)				
Female	2361618 (59.0)	1521819 (58.8)	2287880 (60.2)	1525142 (59.3)
Age (n, %)				
13-17 yrs	166900 (4.2)	99801 (3.9)	173052 (4.6)	111336 (4.3)
18-44 yrs	1946154 (48.6)	1237781 (47.9)	1752849 (46.2)	1163227 (45.2)
45-64 yrs	1892397 (47.2)	1248647 (48.3)	1871879 (49.3)	1299410 (50.5)
Race (n, %)				
White	2014499 (50.3)	1244084 (48.1)	2254979 (59.4)	1486914 (57.8)
Black	789824 (19.7)	543771 (21.0)	870048 (22.9)	545298 (21.2)
Hispanic	540975 (13.5)	441109 (17.1)	605297 (15.9)	386164 (15.0)
Other	660153 (16.5)	357265 (13.8)	67456 (1.8)	155597 (6.0)
Payer (n, %)				
Medicare	446956 (11.1)	312598 (12.1)	569844 (15.0)	444558 (17.3)
Medicaid	1390420 (34.7)	975852 (37.7)	916290 (24.1)	693625 (26.9)
Private	1724216 (43.0)	1078506 (41.7)	1540655 (40.6)	904602 (35.1)
Other	443859 (11.1)	219273 (8.5)	770991 (20.3)	531188 (20.6)

There were no significant changes in age or sex composition for either New York or Florida admissions in the pre and post period (Table 2). However, there were differences in changes in the racial composition of admissions between New York and Florida, namely that the proportion of admissions of Black and Hispanic patients increased over the study period in New York (from 19.7% to 21.0% and 13.5% to 17.1%, respectively; $P < 0.001$), but decreased over the study period in Florida (from 22.9% to 21.2% and 15.9% to 15.0%, respectively; $P < 0.001$). Additionally, there were changes in the composition of payers between the two states, with Florida experiencing a greater decrease in the proportion of privately insured patient admissions (from 40.6% to 35.1%; $P < 0.001$) and a greater increase in the proportion of Medicare patients being admitted to the hospital (from 15.0% to 17.3%; $P < 0.001$) over the study period.

To first visually determine if there was a change in the outcome between the two states across the study period, unadjusted trends of HIV-related admissions for New York and Florida are shown in Figure 1.

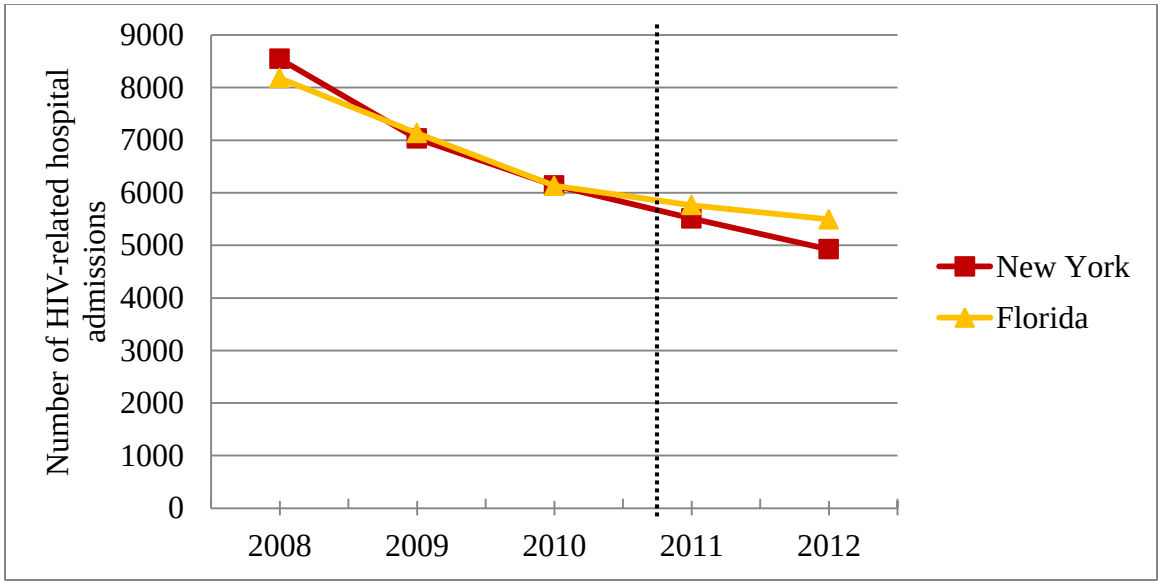

Figure 1. HIV-related hospital admissions in New York and Florida from 2008-2012.

Both New York and Florida experienced decreases in the number of HIV-related hospital admissions during the study period, however the unadjusted trends indicate that New York experienced a steeper downward trend in HIV-related admissions in the period after the 2010 HIV testing law was implemented. The trend in HIV-related admissions for Florida appears to level off in the post-period, relative to the trend seen for New York.

Table 3. Difference-in-difference regression of the NY HIV testing law on HIV-related hospital admissions in New York and Florida from 2008-2012.

	Model 1		Model 2		Model 3	
	coefficient	p-value	coefficient	p-value	coefficient	p-value
Policy	-0.0014	(0.00)	-0.0009	(0.00)	-0.0007	(0.00)
Sex						
Female	--	--	-0.0157	(0.00)	-0.0161	(0.00)
Age group						
13-17 yrs	--	--	-0.0191	(0.00)	-0.0194	(0.00)
18-44 yrs	--	--	(referent)	--	(referent)	--
45-64 yrs	--	--	0.0082	(0.00)	0.0075	(0.00)
Race						
White	--	--	(referent)	--	(referent)	--
Black	--	--	0.0410	(0.00)	0.0366	(0.00)
Hispanic	--	--	0.0099	(0.00)	0.0059	(0.00)
Asian/PI	--	--	-0.0072	(0.00)	-0.0088	(0.00)
Native Am	--	--	-0.0015	(0.01)	-0.0029	(0.00)
Mixed/Other	--	--	0.0058	(0.00)	0.0053	(0.00)
Payer						
Medicare	--	--	--	--	0.0257	(0.00)
Medicaid	--	--	--	--	0.0229	(0.00)
Private	--	--	--	--	(referent)	--
Self-pay	--	--	--	--	0.0003	(0.04)
No charge	--	--	--	--	0.0001	(0.84)
Other	--	--	--	--	0.0075	(0.00)
Constant	0.0251	(0.00)	0.0214	(0.00)	0.0137	(0.00)

*All models include state, year and hospital fixed effects.

Results of the difference-in-differences regression models are shown in Table 3. Controlling for other factors, presence of the NY HIV testing law reduced the percentage of hospital admissions that were HIV-related by 0.07 percentage points ($p < 0.001$).

DISCUSSION

The regression estimates from our analysis suggest that the 2010 NY HIV testing law had a statistically significant effect on reducing HIV-related hospital admissions in New York. However, the results also suggest that the magnitude of the effect is not clinically significant.

In order to rule out that the decreases in HIV-related hospital admissions in New York and Florida were not simply due to population changes, the number of people living with HIV infection was examined using data from the CDC. Since 2008, the CDC has published an annual HIV/AIDS Surveillance Report, which provides a standardized national overview on the current epidemiology of HIV infection and disease in the United States.[10] The surveillance reports uses data from state and territorial health departments, which have implemented systems to collect HIV diagnoses reported to them on a confidential name-based basis. A line graph of CDC-estimated prevalence for HIV infection in New York and Florida during the study period is shown in Figure 2.

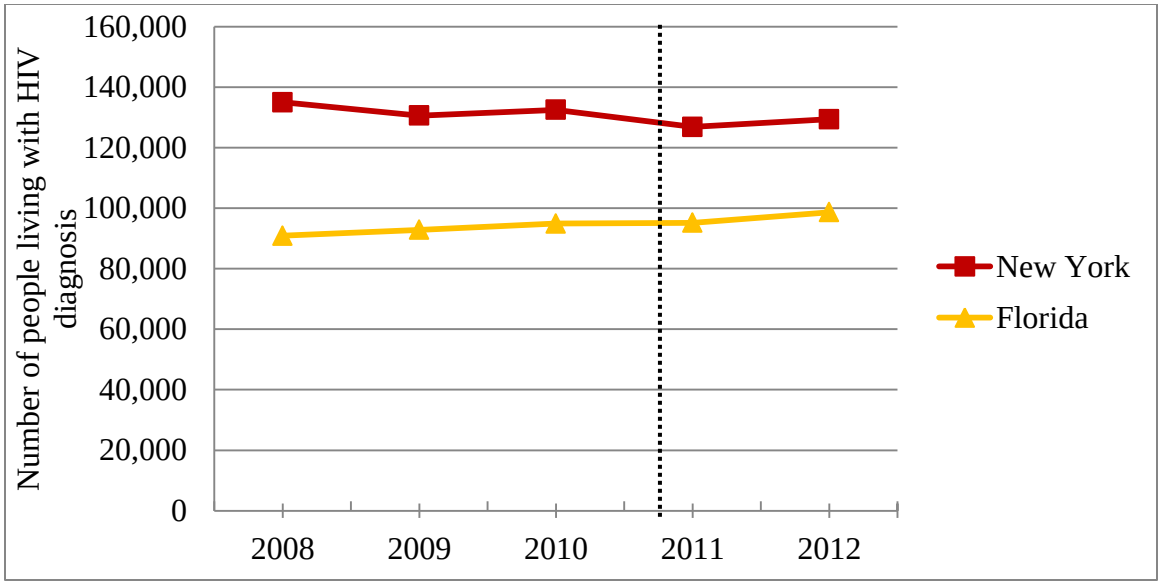

Figure 2. Prevalence of HIV diagnoses in New York and Florida from 2008-2012.

The number of people living with diagnosed HIV infection did not change substantially for either New York or Florida during the study period. This magnitude of change suggests that the decrease in HIV-related admissions was not due to decreases in the number of people diagnosed with HIV. Prevalence of diagnosed HIV infection decreased slightly between the pre and post periods for New York, but magnitude does not appear large enough to explain the decline in HIV-related admissions in New York in Figure 1. Similarly, the prevalence of diagnosed HIV infection increased slightly for both New York and Florida from 2011 to 2012, but New York still experienced a steeper decline in HIV-related admissions. This result suggests that the decline in New York was due to an exogenous effect like the HIV testing policy change and not due to unobserved changes in HIV prevalence.

There are several limitations to this study that might explain the results. First, unobserved factors could have influenced hospitalization rates. For example, hospital admissions are difficult to predict and there are many scenarios, such as patients being admitted that do not reside locally and are difficult to link to proper outpatient care, which are outside the control of the provider. A better outcome to examine may be the rates of hospital readmission for patients diagnosed with HIV, for which the policy treatment would likely have a greater effect than on overall admissions of HIV patients. However, there are several limitations in the data arising from concerns over confidentiality of HIV patients the HCUP State Inpatient Databases, such as missing values for certain patient identifiers, such as income levels, residential zip codes and variables for linking patients with records of readmission.[11]

Secondly, the data may not be granular enough. As a result of patient privacy, the HCUP State Inpatient Databases for New York and Florida only provided the year of admission for HIV patients and not the exact date. Especially because the HIV testing

policy was not passed until September of 2010, it is possible that the pre-period (2008-2010) and post-period (2011-2012) for this study were not long enough to capture the policy effect.

Third, the policy effect could be limited due to imperfect implementation around provider uptake and enforcement of HIV testing and linkage to care protocols. A 2012 study sent electronic surveys to 191 emergency departments (EDs) across New York and found that only 65% of EDs offered HIV testing to all patients aged 13-64 as required by the law and only 29% of EDs could confirm linkage to care for patients testing positive for HIV infection.[12] As a result of the limited implementation, the actual impact of the HIV testing law is likely limited during our study period.

In addition to limitations of the study design, unobserved differences in the characteristics of patients in New York and Florida that changed during the study period could have confounded the estimated policy effect from the difference in differences models. As noted earlier, the proportion of admissions of Black and Hispanic patients increased for New York but decreased for Florida from the pre-period to the post-period. Similarly, Florida experienced a greater decrease in the proportion of patients admitted with private insurance than New York. Differential changes in the racial composition and payers between patients in New York and Florida could be indicative of unobserved changes in patient case-mix.

Changes in insurance coverage that differ between New York and Florida are particularly concerning given the passage of the Affordable Care Act in 2010, which included Medicaid expansion. However, New York already had eligibility requirements higher than the federal mandate prior to the passage of the Affordable Care Act and Florida decided not to expand their income eligibilities for Medicaid.[13] Therefore, Medicaid expansion is unlikely to have influenced our estimates.

Lastly, there are other policy effects that differ between New York and Florida over time and might have had confounding effects on outcomes related to HIV care and treatment. In particular, over the last decade New York has implemented several initiatives to combat HIV/AIDS, which may be different from initiatives implemented by Florida, and could have affected HIV-related hospital admission rates. Also important to consider are federal initiatives and other grant programs related to HIV care and treatment that may have been distributed differentially between New York and Florida. For example, the Ryan White Program, a federal program first enacted in 1990 that provides funding to cities, states and other nonprofit entities to deliver healthcare and support services to medically underserved patients that are affected by HIV disease, provided Florida with $227 million in cumulative funding as of the end of September 2015, but also provided New York with $322 million in cumulative funding.[14] These policy differences could also explain the small estimated effect of the 2010 HIV testing law on HIV-related admissions in New York.

CONCLUSION

The passage of the 2010 NY HIV testing law was a monumental and largely unprecedented effort by the New York state government to address the epidemic of HIV infection. Although difficult to enforce, New York's legislative mandate to providers to follow CDC clinical guidelines for HIV testing, care and treatment signaled a change in the way providers were expected to care for patients with HIV/AIDS, a patient population that has long experienced a history of stigma, mistreatment and clinical misinformation.

Indeed, this study finds that the passage of the 2010 NY HIV testing law alone reduced hospital admissions that were HIV-related by 0.07 percentage points.

While the legislative mandate itself was unfunded and at no direct cost to the New York state government budget, the requirement of providers following the mandate to increase testing has several downstream costs. A prospective cohort study performed in a Denver ED from 2007 to 2009 found that non-targeted HIV screening, like that recommended by the CDC in 2006 and mandated by the NY HIV testing law, resulted in an incremental cost of $10,693 per additional diagnosed infection, with most of the additional costs stemming from increased personnel time and increased HIV testing and blood draw supplies.[15] An additional simulation study found that a nationwide adoption of the 2006 CDC recommendations for HIV testing and care would cost $2.7 billion over five years, with most of the additional costs stemming from the additional demand for government discretionary funding for HIV care.[16]

Therefore, while the HIV testing law was responsible for a small decrease in the percentage of HIV-related admissions in New York, state policymakers seeking to improve delivery of care and outcomes for patients with HIV may find a state-wide provider mandate for HIV testing and linkage to care to be a limited solution and should

supplement such laws with other policies or funding programs to support implementation of the law, or redirect it to more effect interventions for HIV patients.

Future studies on evaluating the HIV testing law may want to look at policy effects on outcomes in ambulatory and outpatient care rather than acute inpatient care. Additional studies may also want to look at long-term effects of the policy as compliance increases.

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